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The Evolution of Intermediate-Redshift Luminous Compact Blue Galaxies

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Abstract. In recent years, there has been a debate on the nature and evolution of the vast population of faint field galaxies found in deep images of the sky. The bluest, highest surface brightness galaxies of this population are known as luminous compact blue galaxies (LCBGs). Two possible evolutionary paths have been suggested for LCBGs. One alternative is that LCBGs are the protobulges of today's massive spirals. The other path proposes that LCBGs are the progenitors of today's population of spheroidal and dwarf elliptical systems. This contribution presents a glimpse of the evidence that has led to considerer one of these two different scenarios.

1. Luminous Compact Blue Galaxies and Their Evolution

Luminous compact blue galaxies (LCBGs) are luminous ($M_B < -17.5$), blue ($B-V < 0.6$, typical of Sc spirals), and compact ($r_{\rm e} < 3.0$ kpc galaxies that are experiencing an extreme star formation episode. They dominated the number density of galaxies at intermediate redshifts ($0.4 < z < 1.0$). LCBGs can be classified into objects that resemble local H II galaxies and objects that resemble local starburst nuclei galaxies. The majority (60%) of the LCBGs belongs to the first category. The variety of the LCBG fauna makes it very unlikely that all objects that satisfy the LCBG requirements will evolve in the same way. Much of the debate on the evolution of LCBGs stems from this complexity. Two different evolutionary paths have been suggested for the two different LCBG subclasses. The first choice, which applies to H II-like systems, argues that these objects are the progenitors of today's spheroidal systems. The second choice, the preferred one for Starburst Nuclei-like LCBGs, sees LCBGs as the rotating protobulges of today's massive spirals.

Although there are many different types of evidence that support both scenarios, here we will only present a small piece of evidence in favor of the first choice. The other possibility is presented in Hammer et al. (2001).

2. Stellar Populations in Luminous Compact Blue Galaxies

The simple stellar population models presented in Hoyos et al. (2007), which are based on HST/STIS long-slit spectroscopy and HST/WFPC2 (F606W and F814W), HST/NICMOS (F160W) imaging show that their particular sample of very blue and isolated H II-like LCBGs could indeed become spheroidal/dwarf elliptical galaxies provided they do not experience further star formation

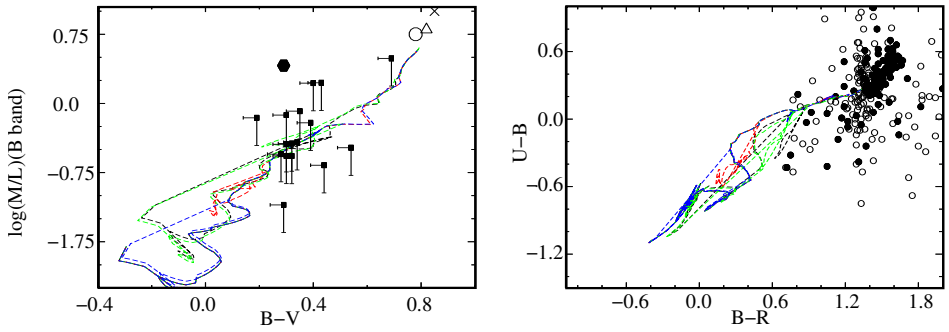

Figure 1. Left panel: Evolution in the $M/L_B - (B-V)$ plane of H II-like LCBGs from intermediate redshift to the present day. The hexagon is the LMC, the cross, triangle and, circle give the location of three local Sph systems. Small squares with error bars show the location of other intermediate-redshift LCBGs. Right panel: Evolution in the $(U-B)-(B-R)$ plane. All circles represent a large sample of Sph systems in the Coma cluster. Filled circles show the brightest of these objects. In both cases, the colored lines show the evolution of the LCBGs studied in Hoyos et al. (2007).

episodes. Their models are constructed using a mixture of two different single stellar populations (SSPs). The first SSP, taken from the Starburst99 (Leitherer et al. 1999) library, mimics the properties of the ionizing population. The second SSP, taken from the library by Bruzual & Charlot (2003), is designed to represent the underlying stellar population of H II-like LCBGs, which is known to exist since the work shown in Guzmán et al. (1998). The main conclusion from the Hoyos et al. (2007) work is that H II-lie LCBGs harbour very young starbursts, with typical metallicities of around $12 + \log \mathrm{O/H} = 8.4$, which are at least ten times more luminous than the well known giant starbursting region 30 Dor.

Fig. 1 shows the evolution of H II-like LCBGs in the $M/L_B - (B-V)$ plane and in the $(U-B)-(B-R)$ plane, according to the models shown in Hoyos et al. (2007). LCBGs are represented by color lines. Intermediate-redshift H II-like LCBGs end their evolution near the locus of the redder and brighter local Sph galaxies.

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